US008694085B2

(12) **United States Patent**
Reifman et al.

(10) **Patent No.: US 8,694,085 B2**
(45) **Date of Patent: Apr. 8, 2014**

(54) **COLLECTION AND ANALYSIS OF VITAL SIGNS**

(75) Inventors: **Jaques Reifman**, New Market, MD (US); **Maxim Y. Khitrov**, Rockville, MD (US); **Andrew T. Reisner**, Newtonville, MA (US); **Liangyou Chen**, Hanover Park, IL (US); **Thomas McKenna**, Frederick, MD (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Army**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/204,657**

(22) Filed: **Aug. 6, 2011**

(65) **Prior Publication Data**

US 2012/0078128 A1 Mar. 29, 2012

Related U.S. Application Data

(60) Provisional application No. 61/401,179, filed on Aug. 6, 2010.

(51) **Int. Cl.**
A61B 5/0432 (2006.01)

(52) **U.S. Cl.**
USPC **600/523**

(58) **Field of Classification Search**
USPC 607/59, 30; 600/510, 513, 523–525
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,683,432 A * 11/1997 Goedeke et al. 607/32
6,182,245 B1 1/2001 Akin et al.
7,222,265 B1 5/2007 LeSuer et al.
7,899,687 B2 3/2011 Morris
2002/0058861 A1 5/2002 Drew
2006/0111933 A1 5/2006 Wheeler
2007/0094227 A1 4/2007 Randazzo et al.
2008/0133275 A1 6/2008 Haug et al.

FOREIGN PATENT DOCUMENTS

EP 1174816 A2 1/2002
WO 2010/035161 A1 4/2010

OTHER PUBLICATIONS

Chen, Liangyou, et al., "Algorithms to Qualify Respiratory Data Collected During the Transport of Trauma Patients," Physiological Measurement, 2006, pp. 797-816, vol. 27.
Chen, Liangyou, et al., "Automated Beat Onset an Peak Detection Algorithm for Field-Collected Photoplethysmograms," 31st Annual International Conference of the IEEE EMBS, Sep. 2-6, 2009, pp. 5689-5692.

(Continued)

Primary Examiner — George Evanisko
(74) *Attorney, Agent, or Firm* — Elizabeth Arwine; Cahn & Samuels, LLP

(57) **ABSTRACT**

A system is disclosed having a storage, a communications module for interacting with a medical measurement device, an analysis controller, and a test module that allows for the testing and evaluating of decision-support algorithms. A method for testing decision-support algorithms is disclosed having the steps of receiving into storage of a ruggedized, compact computer at least one decision-support algorithm; detecting with a communications module the initiation of a vital-sign monitoring session; receiving and storing vital-sign information into storage by the communications module; pushing the stored vital-sign information by an analysis controller to a test module running the stored at least one decision-support algorithm; and providing at least one output from the decision-support algorithm to at least one of a database and a display.

14 Claims, 4 Drawing Sheets